

# Duffy Antigens and Hypertension in a Black Population

JOSEPH M. MILLER, MD, AND JOHN M. MILLER

**Abstract:** Skin color and social class have been suggested as reasons to explain the greater prevalence of hypertension in Blacks as compared to Whites. The presence of Duffy red blood cell proteins, a measure of "whiteness" in Blacks, was unrelated to the presence of elevated blood pressure in 722 Black hospital patients. The finding suggests that social class rather than skin color is associated with the greater prevalence of hypertension in Blacks. (*Am J Public Health* 1985; 75:558-559.)

Hypertension occurs more frequently and produces a greater number of harmful sequelae in end organs in the American Black population than in its White counterpart. The reasons for this difference are not clear.

Boyle proposed a genetic reason for the higher prevalence of hypertension in Blacks, based upon a positive correlation of elevated blood pressure with skin color as determined by a photoelectric reflectance colorimeter.<sup>1</sup> A subsequent study, however, suggested that social class and age were more consistently associated with the incidence of hypertension.<sup>2</sup>

The interpretation of two other studies suggesting a genetic explanation<sup>3,4</sup> have been challenged. The darker individuals among Blacks were poorer, less well educated, and more subject to social stress. Their higher prevalence of hypertension was felt to be a result of enhanced social stress.<sup>5</sup>

The best measure of "whiteness" is the presence of positive Duffy blood proteins. This study was undertaken to determine if an association existed between the presence of Duffy proteins and the prevalence of hypertension in a group of Blacks.

Members of the White race always possess a positive phenotype for Duffy red blood cell antigens and African Blacks have only a small positive rate; thus determination of the phenotype in American Blacks permits an estimation of the degree of genetic admixture which has occurred in a particular Black population. The assumption that African Blacks had a consistently negative profile, before admixture with Whites occurred, may be made. A previously reported study of Duffy blood proteins in the present Black population noted that a large difference in the number of positive reactors was apparent when a comparison was made with African Blacks.<sup>6,7</sup>

## Method

The antibodies for Fy<sup>a</sup> and Fy<sup>b</sup>, the positive Duffy antigens, are in the immunoglobulin G class and testing for them requires the use of the Coombs' test. Testing for Duffy genotype followed the method of American Dade.<sup>8</sup>

From the Department of Medical Education, Provident Hospital, Inc., Baltimore. Address reprint requests to Dr. Joseph M. Miller, Director of Medical Education, Provident Hospital, Inc., 2600 Liberty Heights Avenue, Baltimore, MD 21215. This paper, submitted to the Journal June 19, 1984, was revised and accepted for publication December 19, 1984.

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The individuals studied were admitted to the hospital for a wide variety of diseases. Blood sent for routine laboratory examinations was used for Duffy determinations. Medical records were examined only after the immunologic studies were done. Patients classified as having hypertension had a systolic pressure equal to or greater than 160mm of mercury, a diastolic pressure of 90 or above, or were under active treatment for high blood pressure. In every individual, clinical evidence supporting the diagnosis appeared in the medical record.

## Results

The blood sera of 722 hospital patients were examined (209 men and 513 women). A positive phenotype represented either Fy<sup>a</sup>Fy<sup>a</sup>, Fy<sup>a</sup>Fy<sup>b</sup>, or Fy<sup>b</sup>Fy<sup>b</sup> while a negative result was an FyFy. In the men, a positive result was demonstrated in 74 and a negative in 135; 182 women showed a positive reaction and 331 were negative. All age groups were represented with 304 individuals in the 0-30 age group (41 men and 263 women); 240 in the 31-60 age group (86 men and 154 women); and 178 over age 61 (82 men and 96 women).

A diagnosis of hypertension was made in 146 patients (51 men and 95 women). In these subsets, 16 of the 51 men had positive Duffy proteins, 35 were negative; 41 of the 95 women were positive, and 54 negative.

A substantial association between the presence of positive Duffy blood proteins and the appearance of hypertension could not be established. The approximate relative risk for the occurrence of hypertension in the presence of positive Duffy blood proteins is 1.21 with 95 per cent confidence limits of 0.83 and 1.75.<sup>9</sup> Control for the confounders of sex and the age periods of 0-30, 31-60, and over 60 was obtained by the use of the summary odds ratio estimates of Mantel and Haenszel.<sup>10</sup> A relative risk of 1.06 resulted from the employment of their method (95 per cent confidence limits 0.73 and 1.54).

## Discussion

This study demonstrated a lack of a positive association between hypertension and the presence of positive Duffy blood proteins, both before and after controlling for multiple confounders. The removal of bias by the adjustment for confounders evoked little change in the estimate of relative risk. In contrast to the studies previously reported, which depended upon a visual or light reflectance classification of color, we failed to find a genetically indicated relationship between the degree of "blackness" and the presence of elevated blood pressure. Social class indicators were not studied.

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#### ACKNOWLEDGMENTS

This work was partially supported by the United Way of Central Maryland.

### Taking Stock of Health Appropriations in 1913

*"... No health department has as yet been organized on a scientific basis. Its powers and duties are given to it hap-hazard, sometimes from terror at an epidemic, sometimes at the insistence of a trade which hopes for benefit, sometimes because a counsilman through exuberant enthusiasm, or for personal reasons, pushes a pet project, and sometimes, and this with increasing frequency, because some band of earnest reformers with more energy than wisdom, hopes to abolish some sanitary evil by plans of its own. More rarely it happens that a well conceived plan of the health officer is crystallized in an ordinance and vivified by an appropriation.*

*"The merchant or the manufacturer if he hopes to succeed against competitors, must by good accounting learn which goods yield the highest profit. So the health officer, if he wishes his department to have its due share of the municipal budget, must learn which line of work yields the most for the sum expended. He should seek for greater financial assistance for the most effective work and should eliminate, cut down, or at least not emphasize, those functions which yield little return for the money. It is difficult to change the directions of sanitary endeavor but certainly it is our duty at frequent intervals to take account of stock and try thereby to discover the most profitable lines. It is also our duty to clearly set forth our conclusions even though it may not be easy to convert the public, and particularly town and city councils, to new view points."*

—Chapin CV: How shall we spend the health appropriation? *Am J Public Health* 1913; 3:202-208.